

WHAT IS CLAIMED IS:

- 1                   1.     A system for controlling an appliance comprising:  
2                   a radio receiver operative to receive radio frequency control signals  
3     for controlling the appliance, the controlling radio frequency signals having  
4     predetermined receiver characteristics;  
5                   at least one existing radio frequency transmitter, each existing  
6     transmitter specifically designed to transmit wireless radio frequency control signals  
7     having the predetermined receiver characteristics to the radio receiver;  
8                   a new wireless radio frequency transmitter having predetermined  
9     transmitter characteristics, at least one predetermined transmitter characteristic not  
10    compatible with the radio receiver; and  
11                  a radio relay operative to  
12                  (a)    learn the receiver characteristics from one of the at least one  
13                        existing transmitter,  
14                  (b)    learn at least one transmitter characteristic from the new  
15                        transmitter,  
16                  (c)    receive an appliance radio frequency activation command  
17                        from the new transmitter, the activation command exhibiting  
18                        transmitter characteristics, and  
19                  (d)    transmit a new radio frequency appliance activation command  
20                        based on the received appliance activation command, the new  
21                        appliance activation command having the receiver  
22                        characteristics.
- 1                   2.     The system of claim 1 wherein the radio relay is further  
2     operative to determine as one of the receiver characteristics whether the receiver  
3     operates using a fixed code or a variable code.
- 1                   3.     The system of claim 2 wherein, if the receiver operates using  
2     a fixed code, the radio relay stores the fixed code as one of the receiver  
3     characteristics.

1                   4.     The system of claim 1 wherein the existing transmitter from  
2     which the radio relay learned the receiver characteristics transmits an existing  
3     transmitter identifier, the radio relay storing the existing transmitter identifier as one  
4     of the receiver characteristics.

1                   5.     The system of claim 1 wherein the existing transmitter from  
2     which the radio relay learned the receiver characteristics transmits an existing  
3     transmitter identifier, the radio relay storing as one of the receiver characteristics  
4     a transmitter identifier different from the existing transmitter identifier.

1                   6.     The system of claim 1 wherein one of the receiver  
2     characteristics is a carrier frequency of the radio frequency control signals.

1                   7.     The system of claim 1 wherein one of the receiver  
2     characteristics is a code word contained in data modulating a carrier frequency of  
3     the radio frequency control signals.

1                   8.     The system of claim 1 wherein one of the receiver  
2     characteristics is a type of code contained in data modulating a carrier frequency of  
3     the radio frequency control signals.

1                   9.     The system of claim 1 wherein the radio relay functions as a  
2     clone of the existing transmitter from which the radio relay learned the receiver  
3     characteristics.

1                   10.    The system of claim 1 wherein the radio frequency control  
2     signals received by the radio receiver contain a rolling code, the receiver operative  
3     to ignore control signals having a rolling code value within a rear window of  
4     possible rolling code values, the radio relay transmitting radio frequency control  
5     signals to the radio receiver so as to place the existing transmitter from which the  
6     radio relay learned the receiver characteristics into the receiver rolling code value  
7     rear window.

1                   11.    The system of claim 10 wherein the radio relay is operative  
2   to receive a transmission from the existing transmitter from which the radio relay  
3   learned the receiver characteristics and to transmit a radio frequency control signal  
4   to the receiver based on the received transmission, the transmitted radio frequency  
5   control signal having a rolling code value outside of the receiver rolling code value  
6   rear window.

1                   12.    The system of claim 1 wherein the appliance is a first  
2   appliance, the system further comprising a second appliance, the radio relay  
3   operative to determine from a radio frequency command received from the new  
4   transmitter whether the radio frequency command is directed to the first appliance  
5   or the second appliance.

1                   13.    A method for controlling an appliance, the appliance  
2   controlled by radio frequency transmissions from at least one existing radio  
3   frequency transmitter, the method comprising:  
4                   receiving a radio transmission from an existing wireless radio  
5   frequency transmitter, the existing radio frequency transmitter transmitting radio  
6   frequency signals having a first set of transmission characteristics;  
7                   storing data representing the first set of transmission characteristics;  
8                   receiving a radio transmission from a new wireless transmitter, the  
9   new transmitter transmitting radio frequency signals having a second set of  
10   transmission characteristics different from the first set of transmission  
11   characteristics;  
12                  storing data representing at least one characteristic from the second  
13   set of transmission characteristics;  
14                  receiving an activation request from the new transmitter; and  
15                  transmitting the activation request to the appliance with a radio  
16   frequency signal based on the first set of transmission characteristics.

1                   14.    The method of claim 13 wherein transmission characteristics  
2   comprises carrier frequency.

1                   15.    The method of claim 13 wherein transmission characteristics  
2 comprises a transmitter identifier.

1                   16.    The method of claim 13 wherein transmission characteristics  
2 comprises an indication as to whether the radio transmission contains a fixed code  
3 or a variable code.

1                   17.    The method of claim 13 further comprising:  
2                   determining that the existing radio frequency transmitter transmits a  
3 rolling code; and  
4                   transmitting at least one radio frequency signal based on the first set  
5 of transmission characteristics which places the existing transmitter in a region of  
6 rolling code values ignored by the appliance.

1                   18.    The method of claim 17 further comprising:  
2                   receiving an activation request from the existing transmitter, the  
3 activation request having a first rolling code value, the first rolling code value within  
4 the region of rolling code values ignored by the appliance; and  
5                   transmitting the activation request with a second rolling code value  
6 outside the region of rolling code values ignored by the appliance.

1                   19.    The method of claim 13 further comprising:  
2                   storing data representing a third set of transmission characteristics;  
3                   associating the data representing the third set of transmission  
4 characteristics with a second appliance; and  
5                   associating the data representing the third set of transmission  
6 characteristics with a particular activation signal received from the new transmitter.

1                   20.    A universal garage door opener for opening a garage door, the  
2 garage door is controlled by a radio frequency receiver responsive to an existing  
3 radio frequency transmitter, the receiver responding to an activation signal sent by  
4 the existing transmitter having a first set of signal characteristics, the garage door  
5 opener comprising:

6                   a wireless radio frequency receiver operative to receive radio  
7 frequency control signals transmitted with any one of a plurality of signal  
8 characteristics including the first set of signal characteristics;  
9                   a wireless radio frequency transmitter operative to transmit radio  
10 frequency control signals having any one of the plurality of signal characteristics;  
11                   a user interface; and  
12                   control logic in communication with the receiver, the transmitter and  
13 the user interface, the control logic operative to  
14                   (a)    switch to a learn mode in response to the user interface,  
15                   (b)    while in the learn mode, receive an activation signal  
16                        transmitted by the existing transmitter,  
17                   (c)    determine the first set of signal characteristics from the  
18                        received activation signal,  
19                   (d)    switch to an operate mode,  
20                   (e)    receive an activation request from a radio frequency signal  
21                        having a second set of signal characteristics, and  
22                   (f)    transmit the activation request with a radio frequency signal  
23                        having the first set of signal characteristics.

1                   21.    The universal garage door opener as in claim 20 wherein the  
2 control logic learns at last one of the second set of signal characteristics by receiving  
3 a radio frequency signal from a new transmitter different than existing transmitter.

1                   22.    The universal garage door opener as in claim 20 wherein the  
2 control logic determines from the activation signal received from the existing  
3 transmitter that the receiver operates only when the receiver receives a fixed code,  
4 the control logic is further operative to store the fixed code received from the  
5 existing transmitter.

1                   23.    The universal garage door opener as in claim 20 wherein the  
2 control logic determines a transmitter identifier of the existing transmitter from the  
3 activation signal received from the existing transmitter, the control logic operative  
4 to transmit the activation request with the transmitter identifier.

1                   24.     The universal garage door opener as in claim 20 wherein the  
2 control logic determines a transmitter identifier of the existing transmitter from the  
3 activation signal received from the existing transmitter, the control logic operative  
4 to transmit the activation request with a transmitter identifier different from the  
5 existing transmitter identifier.

1                   25.     The universal garage door opener as in claim 20 wherein the  
2 control logic determines from the activation signal received from the existing  
3 transmitter that the existing transmitter transmitted a rolling code.

1                   26.     The universal garage door opener as in claim 25 wherein the  
2 control logic transmits at least one activation signal placing the existing transmitter  
3 into a range of rolling code values that will be ignored by the receiver.

1                   27.     The universal garage door opener as in claim 26 wherein the  
2 control logic determines that a received activation signal is from the existing  
3 transmitter and then transmits another activation signal having a rolling code value  
4 within a range of rolling code values that will be accepted by the receiver.

1                   28.     The universal garage door opener as in claim 20 wherein the  
2 control logic is operative to assign one of a plurality of channels to the first set of  
3 signal characteristics, thereby allowing the universal garage door opener to operate  
4 a plurality of radio frequency devices.

1                   29.     The universal garage door opener as in claim 20 further  
2 comprising a second transmitter operative to transmit signals through AC wiring,  
3 the control logic further operative to associate a received activation request with an  
4 appliance interconnected to the universal garage door opener through the AC wiring.

1                   30.     A radio relay for controlling at least one appliance, the  
2 appliance receiving radio frequency control having predetermined receiver

3 characteristics from at least one existing radio frequency transmitter, the radio relay  
4 comprising:  
5 at least one antenna for receiving and transmitting wireless radio  
6 signals;  
7 a receiver in communication with the at least one antenna;  
8 a transmitter in communication with the at least one antenna; and  
9 control logic in communication with the receiver and the transmitter,  
10 the control logic operative to  
11 (a) learn the receiver characteristics from one of the at least one  
12 existing transmitter,  
13 (b) learn at least one transmitter characteristic from a new  
14 transmitter based on wireless signals received from the new  
15 transmitter, the at least one transmitter characteristic different  
16 from any corresponding receiver characteristic,  
17 (c) receive an appliance radio frequency activation command  
18 from the new transmitter, the activation command exhibiting  
19 transmitter characteristics, and  
20 (d) transmit a new radio frequency appliance activation command  
21 based on the received appliance activation command, the new  
22 appliance activation command having the receiver  
23 characteristics.

1 31. The radio relay of claim 30 wherein the control logic is  
2 operative to determine as one of the receiver characteristics whether the receiver  
3 operates using a fixed code or a variable code.

1 32. The radio relay of claim 31 wherein, if the receiver operates  
2 using a fixed code, the control logic stores the fixed code as one of the receiver  
3 characteristics.

1 33. The radio relay of claim 30 wherein the existing transmitter  
2 from which the radio relay learned the receiver characteristics transmits an existing

3 transmitter identifier, the radio relay storing the existing transmitter identifier as one  
4 of the receiver characteristics.

1 34. The radio relay of claim 30 wherein the existing transmitter  
2 from which the radio relay learned the receiver characteristics transmits an existing  
3 transmitter identifier, the radio relay storing as one of the receiver characteristics  
4 a transmitter identifier different from the existing transmitter identifier.

1 35. The radio relay of claim 30 wherein one of the receiver  
2 characteristics is a carrier frequency of the radio frequency control signals.

1 36. The radio relay of claim 30 wherein one of the receiver  
2 characteristics is a code word contained in data modulating a carrier frequency of  
3 the radio frequency control signals.

1 37. The radio relay of claim 30 wherein one of the receiver  
2 characteristics is a type of code contained in data modulating a carrier frequency of  
3 the radio frequency control signals.

1 38. The radio relay of claim 30 wherein the radio relay functions  
2 as a clone of the existing transmitter from which the radio relay learned the receiver  
3 characteristics.

1 39. The radio relay of claim 30 wherein the radio frequency  
2 control signals received by the radio receiver contain a rolling code, the receiver  
3 operative to ignore control signals having a rolling code value within a rear window  
4 of possible rolling code values, the radio relay transmitting radio frequency control  
5 signals to the radio receiver so as to place the existing transmitter from which the  
6 radio relay learned the receiver characteristics into the receiver rolling code value  
7 rear window.

1 40. The radio relay of claim 39 wherein the radio relay is  
2 operative to receive a transmission from the existing transmitter from which the



3 radio relay learned the receiver characteristics and to transmit a radio frequency  
4 control signal to the receiver based on the received transmission, the transmitted  
5 radio frequency control signal having a rolling code value outside of the receiver  
6 rolling code value rear window.

1 41. The radio relay of claim 30 wherein the control logic  
2 establishes a plurality of channels, each channel assignable to one of a plurality of  
3 appliances, the control logic determining one of the channels based on a radio  
4 frequency command received from the new transmitter.

1 42. The radio relay of claim 30 further comprising a second  
2 transmitter operative to transmit an activation signal through AC wiring.